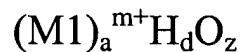


WHAT IS CLAIMED IS:

1. A process for producing an organic hydroperoxide comprising reacting an organic compound having at least one carbon-hydrogen bond capable of being oxidized to a hydroperoxide-carbon bond with oxygen in the presence of a catalyst comprising a transition metal oxides of empirical formulation in the anhydrous state

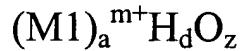


where M1 is a transition metal selected from the set Mn, Co, Cr, V, Mo, Fe, Cu, and Ni, which comprises between 0.1 % and 90 % of the catalyst by weight, "a" is the moles of the M1 metal in the transition metal oxide and is defined to be equal to 1,
10 "m" is the average valence of M1 and is greater than 0, "d" is the mole ratio of hydrogen to M1 and varies from 0 to about "z", and "z" is the mole ratio of O to M1 and is given by

$$z = (a \cdot m + d)/2 = (m + d)/2$$

2. The process of claim 1 wherein the organic compound is selected from the group consisting essentially of hydrocarbonaceous compounds having from about 5 to about 30 carbon atoms.
3. The process of claim 1 wherein the organic compound is an aryl alkyl hydrocarbon.
4. The process of claim 1 wherein the organic compound is a heterocyclic compound.

5. The process of claim 1 wherein the organic compound is a heterocyclic compound containing sulfur.
6. The process of claim 1 wherein reaction conditions include a temperature from about 43°C (110°F) to about 260°C (500°F) and a pressure from about 100 kPa (0 psig) to about 3.5 MPa (500 psig).
7. A process for producing an organic hydroperoxide comprising reacting an organic compound having at least one carbon-hydrogen bond capable of being oxidized to a hydroperoxide-carbon bond with oxygen in the presence of a catalyst comprising physical mixtures of transition metal oxides, the mixture given by the empirical formula when in the anhydrous state

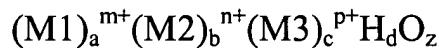


where M1 includes at least two metals selected from the group Mn, Co, Cr, V, Mo, Fe, Cu, and Ni, which together comprise between 0.1 % and 90 % of the catalyst by weight, “a” is the sum of the mole fractions of the individual M1 metals and is defined to be 1, “m” is the weighted average valence of the M1 metals and is greater than 0, “d” is the mole ratio of hydrogen to the moles of M1 metals and varies from 0 to about “z”, and z is the mole ratio of oxygen to the M1 metals and is given by

$$z = (a \cdot m + d)/2$$

8. The process of claim 7 wherein the organic compound is selected from the group consisting essentially of hydrocarbonaceous compounds having from about 5 to about 30 carbon atoms.

9. The process of claim 7 wherein the organic compound is an aryl alkyl hydrocarbon.
10. The process of claim 7 wherein the organic compound is a heterocyclic compound.
- 5 11. The process of claim 7 wherein the organic compound is a heterocyclic compound containing sulfur.
12. The process of claim 7 wherein reaction conditions include a temperature from about 43°C (110°F) to about 260°C (500°F) and a pressure from about 100 kPa (0 psig) to about 3.5 MPa (500 psig).
- 10 13. A process for producing an organic hydroperoxide comprising reacting an organic compound having at least one carbon-hydrogen bond capable of being oxidized to a hydroperoxide-carbon bond with oxygen in the presence of a catalyst comprising a complex transition metal oxide containing at least one M1 transition metal component wherein the anhydrous oxide is described by the empirical
- 15 formulation



where M1 is a transition metal component selected from Mn, Co, Cr, V, Mo, Fe, Cu, Ni, and mixtures thereof which comprise between 0.1 % and 90 % of the catalyst by weight, “a” is the sum of the mole fractions of M1 metals and is defined to be 1, “m” is the weighted average valence of the M1 metals and is greater than 0, M2 is selected from the group of cations and metals including ammonium ion, organoammonium ions, alkali metals, alkaline earth metals, rare earth metals, selected early transition

metals, and main group metals, including NH₄⁺, n-propylammonium, Li, Na, K, Rb, Cs, Mg, Ca, Sr, Ba, La, Ce, Sm, Pr, Yb, Sc, Y, Ti, Zr, Hf, Al, Ga, In, Sn, Bi, and mixtures thereof, “b” is the mole ratio of M₂ cations and metals to the M₁ metals and is greater than or equal to 0, “n” is the weighted average valence of the M₂ cations and

5 metals and is greater than 0, M₃ is selected from the main group elements that form complex oxoanions such as C, Si, P, and Ge, “c” is the mole ratio of M₃ to the M₁ metals and is greater than or equal to 0, “p” is the weighted average valence of M₃ and is greater than 0, “d” is mole ratio of hydrogen to the M₁ metals and varies from 0 to about “z”, “z” is mole ratio of O to M₁ metals and is given by

10
$$z = (a \cdot m + b \cdot n + c \cdot p + d)/2$$

wherein if b + c = 0, then the complex oxide comprises more than one M₁ transition metal.

14. The process of claim 13 wherein the organic compound is selected from the group consisting essentially of hydrocarbonaceous compounds having from about 5 to

15 about 30 carbon atoms.

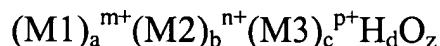
15. The process of claim 13 wherein the organic compound is an aryl alkyl hydrocarbon.

16. The process of claim 13 wherein the organic compound is a heterocyclic compound.

20 17. The process of claim 13 wherein the organic compound is a heterocyclic compound containing sulfur.

18. The process of claim 13 wherein reaction conditions include a temperature from about 43°C (110°F) to about 260°C (500°F) and a pressure from about 100 kPa (0 psig) to about 3.5 MPa (500 psig).

19. A process for producing an organic hydroperoxide comprising reacting an
5 organic compound having at least one carbon-hydrogen bond capable of being oxidized to a hydroperoxide-carbon bond with oxygen in the presence of a catalyst comprising physical mixtures of the complex oxides, physical mixtures of simple oxides, or physical mixtures of complex oxides and simple oxides where the simple and complex oxides are oxide compounds of M1, M2, and M3 in which at least one of
10 the oxide components in the mixture contains at least one M1 metal, the anhydrous mixture given by the empirical formulation



where M1 is a transition metal component selected from Mn, Co, Cr, V, Mo, Fe, Cu, Ni, and mixtures thereof which comprise between 0.1 % and 90 % of the catalyst by weight, “a” is the sum of the mole fractions of M1 metals and is defined to be 1, “m” is the weighted average valence of the M1 metals and is greater than 0, M2 is selected from the group of cations and metals including ammonium ion, organoammonium ions, alkali metals, alkaline earth metals, rare earth metals, selected early transition metals, and main group metals, including NH₄⁺, n-propylammonium, Li, Na, K, Rb, Cs, Mg, Ca, Sr, Ba, La, Ce, Sm, Pr, Yb, Sc, Y, Ti, Zr, Hf, Al, Ga, In, Sn, Bi, and mixtures thereof, “b” is the mole ratio of M2 cations and metals to the M1 metals and is greater than or equal to 0, “n” is the weighted average valence of the M2 cations and

metals and is greater than 0, M3 is selected from the main group elements that form complex oxoanions such as C, Si, P, and Ge, “c” is the mole ratio of M3 to the M1 metals and is greater than or equal to 0, “p” is the weighted average valence of M3 and is greater than 0, “d” is mole ratio of hydrogen to the M1 metals and varies from 0 to

5 about “z”, “z” is mole ratio of O to M1 metals and is given by

$$z = (a \cdot m + b \cdot n + c \cdot p + d)/2$$

wherein any combination of the oxides can be mixed in any proportion to obtain the desired catalyst provided the weight fraction of M1 in the catalyst falls in the 0.1 % to 90 % range.

- 10 20. The process of claim 19 wherein the organic compound is selected from the group consisting essentially of hydrocarbonaceous compounds having from about 5 to about 30 carbon atoms.
21. The process of claim 19 wherein the organic compound is an aryl alkyl hydrocarbon.
- 15 22. The process of claim 19 wherein the organic compound is a heterocyclic compound.
23. The process of claim 19 wherein the organic compound is a heterocyclic compound containing sulfur.
24. The process of claim 19 wherein reaction conditions include a temperature from about 43°C (110°F) to about 260°C (500°F) and a pressure from about 100 kPa (0 psig) to about 3.5 MPa (500 psig).

25. A process for producing an organic hydroperoxide comprising reacting an organic compound having at least one carbon-hydrogen bond capable of being oxidized to a hydroperoxide-carbon bond with oxygen in the presence of a catalyst consisting of at least one transition metal M1 selected from the group Mn, Co, Cr, V, Mo, Fe, Cu, Ni, supported on an inorganic support selected from the group consisting essentially of at least one of the simple oxides, complex oxides, phosphates, silicates, germanates and carbonates of the alkali metals, alkaline earth metals, early transition metals such as Sc, Ti, Y, Zr, Lu, and Hf, rare earth metals, and main group metals such as Al, Ga, Si, Ge, In, and Bi, such that the M1 metals comprise a 0.1 % to 90 % weight fraction of the catalyst and the weighted average valence of the M1 metals is greater than 0.
- 10
26. The process of claim 25 wherein the organic compound is selected from the group consisting essentially of hydrocarbonaceous compounds having from about 5 to about 30 carbon atoms.
- 15
27. The process of claim 25 wherein the organic compound is an aryl alkyl hydrocarbon.
28. The process of claim 25 wherein the organic compound is a heterocyclic compound.
29. The process of claim 25 wherein the organic compound is a heterocyclic compound containing sulfur.
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30. The process of claim 25 wherein reaction conditions include a temperature from about 43°C (110°F) to about 260°C (500°F) and a pressure from about 100 kPa (0 psig) to about 3.5 MPa (500 psig).